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Diesel or turboelectric drive for ships

The present invention relates to a diesel or turboelectric drive for ships comprising two contrarotating propellers, whereby the shaft of the one propeller is fed through a hollow shaft of the other propeller. Using contrarotating propellers leads to a reduction for the diameter of approximately 10 % and to an improvement of the effectiveness of approximately 6 to 7 % compared to a fixed propeller of the same driving power.

For the previous examples, contrarotating propellers of one or several combustion machines (diesel motors, turbines) are driven by a gear arrangement. In doing so each propeller shaft requires a coupling gear. Such coupling gears can be avoided by using two electric motors as driving motors. For a conventional drive, the electric motor driving the hollow shaft has a passage in the rotor for the shaft of the second electric motor.

The object of the present invention is to provide by simple means a drive which can be controlled over a wide rotation speed range. According to the present invention, this object can be achieved for the above mentioned diesel or turboelectric drive in that the rotation speed of both propellers can be controlled in the range of range of 100 % to approximately 30 % by changing the rotation speed of the combustion machine and in that, for a further change of the rotation speed, the rotation speed of the second propeller in the range below 30 % can be changed by a rotation speed control and an inversion of the direction of rotation of the corresponding electric drive motor, while maintaining constant the rotation speed of the first propeller. In that way, it is possible to control by simple means the rotation speed even below the lowest operating rotation speed of the combustion machine, because only the drive motor of the one propeller has to be controlled in regard to its rotation speed. For the rotation speed control below 30 % of the operating rotation speed, increased heat losses are generated in only one

electric drive machine. If for the rotation speed control below 30 % both propellers are driven in the same direction, then they generate opposing thrusts. By operating one propeller with the operating rotation speed given by the lowest rotation speed of the combustion machine, while changing the rotation speed of the other propeller at the same direction of rotation, it is possible to control the rotation speed up to standstill.

In the drawing, one embodiment of the invention is illustrated.

The figure shows a diesel electric drive for a ship with two contrarotating propellers 1a and 1b, the ship being indicated by a contour line S. The shaft 2a is fed through the hollow shaft 2b of the other propeller 1b. Synchronous motors 3 and 4 serve for the driving of the propellers, the synchronous motors being fed by a synchronous generator 5 coupled to a diesel motor 6. The directions of rotation of both synchronous motors are opposite to each other. For the arrangement according to the present invention, a rotation speed change in the range of 100 % to approximately 30 % is conducted by a rotation speed controlling of the diesel motor 3. A rotation speed control device 7 serves for this purpose, the rotation speed control device affecting the rotation speed controller 8 of the diesel motor 6. By changing the rotation speed of the diesel motor 6, the rotation speed of the synchronous motors 3 and 4 changes with the frequency of the rotating current generator 5. For controlling the rotation speed below the lowest operating rotation speed of the diesel motor 6, the rotation speed of the propeller 1b can be changed in the range below 30 % by controlling the rotation speed and inverting the direction of rotation of the synchronous motor 3, while the propeller 1a driven by the synchronous motor 4 rotates with a constant rotation speed of approximately 30 % of the operating rotation speed. In the lower rotation speed control range it is possible, at first, for opposite directions of rotation of the two propellers, to reduce to zero the rotation speed of the synchronous motor 3 by slip control. For this purpose, the synchronous motor 3 is provided with a cage winding. After its excitation has been turned off, it operates in the rotation speed range below of 30 % in the asynchronous operating mode, wherein the rotation speed is changed by reducing the excitation of the rotating current generator 5. Starting from the standstill of the synchronous motor 3 and for the further reduction of the thrust, an inversion of the direction of rotation is

conducted and therefore a commutator switch associated to the rotation speed control device 7 affects a synchronization of both propellers 1a and 1b. If one allows the synchronous motor 3 after its standstill to start again by changing the excitation of the rotating current generator 5, than both propellers rotate in the same direction of rotation und generate opposite thrusts. With increasing rotation speed of the propeller 2b a decreasing differential thrust of both propeller 1a and 1 b is generated. For same speeds of rotation of the propeller shafts 2a and 2b, the thrusts of both propellers 1a and 1b neutralize and the resulting driving force of the ship is zero.

Preferably, a program controlling unit is assigned to the rotation speed control device 7 for a self-acting controlling of the rotation speed, a reversion of polarity and a controlling of speed rotation of the synchronous motor 3. In that way, it is possible to control a speed of rotation also in the lowest range of rotation speed.

2 patent claims

1 figure